

U.S. Patent Application Serial No. 10/593,644
Response filed April 7, 2008
Reply to OA dated January 9, 2008

REMARKS

Claims 1-9 are pending in this application. Claims 1 and 2 are amended herein. Upon entry of this amendment, claims 1-9 will be pending. Entry of this amendment and reconsideration of the rejections are respectfully requested.

No new matter has been introduced by this Amendment. Support for the amendments to the claims is discussed below.

Claims 1, 3, 4, 6 and 7 are rejected under 35 U.S.C. §103(a) as being obvious over Takagi et al. (U.S. Patent No. 4,443,650), in view of Funahashi et al. (U.S. Patent No. 6,376,763) and Yoshimoto et al. (U.S. Patent No. 5,352,299). (Office action paragraph no. 6)

The rejection is overcome by the amendments to the claims.

With regard to claim 1, the Examiner cites Takagi for disclosing a thermoelectric converter element comprising p-type and n-type semiconductor films and a flexible insulating substrate, citing column 2, line 58, to column 3, line 8. The Examiner cites column 3, lines 1-6, as disclosing that the films can be connected by a metallic layer or directly to one another, and notes that Figs. 4A and 4B show the p-type and n-type layers as reference numerals 1 and 2, respectively. The Examiner states that Takagi discloses use of conventional thermoelectric films in column 8, line 61, to column 9, line 12, but does not teach that the p-type and n-type layers are complex oxides.

The Examiner cites Funahashi as teaching a p-type semiconductor oxide made of a complex oxide of formula $\text{Ca}_{3-x}\text{RE}_x\text{Co}_4\text{O}_y$, where RE is a rare earth metal, including lanthanides. Yoshimoto

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is cited for disclosing a n-type semiconductor film of formula $(\text{Ln}_{1-x}\text{A}_x)_2\text{MoO}_4$, at column 2, lines 5-26, where Ln is Y, La, Dy, Yb or Sm (column 2, lines 15-18), and that M can be a transition element including Cu, Ti, Fe, Ni, Zn, Co and Mn.

In the amendment to claim 1, the oxides represented by Formula (1) : $\text{Ca}_a\text{A}^1\text{bCo}_c\text{A}^2\text{dO}_e$, have been deleted from Claim 1, and the subordinate oxides represented by the formula: $\text{Ca}_a\text{A}^1\text{bCo}_4\text{O}_e$, from Claim 2. With this amendment, the p-type thermoelectric materials recited in clause (i) of claims 1 and in claim 2 are not disclosed in Funahashi et al.

In addition, the oxides represented by Formula (4) : $(\text{Ln}_s\text{R}^3)_2\text{Ni}_u\text{R}^4\text{vO}_w$, have been deleted from Claim 1, and the subordinate oxides represented by the formula: $(\text{Ln}_s\text{R}^3)_2\text{NiO}_w$, have been deleted from Claim 2. With this amendment, the n-type thermoelectric materials recited in clause (ii) of claim 1 and in claim 2 are not disclosed in Yoshimoto et al.

As discussed above, although Takagi et al. discloses a thermoelectric converter element comprising a p-type thermoelectric material and an n-type thermoelectric material electrically connected to each other, it nowhere describes the specific p-type and n-type thermoelectric materials recited in the amended claims. In the claims, as amended, the p-type thermoelectric material and the n-type thermoelectric material are different from that of Funahashi et al. and that of Yoshimoto et al., respectively.

In addition to the above remarks, Applicant also submits that the combination of components in the thermoelectric element of claim 1 has unexpected results over the prior art. As described on page 6, line 32, to page 7, line 15, of the instant specification, the thermoelectric element of the

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invention has the feature that combinations of specific complex oxides are used respectively as the p-type thermoelectric material and the n-type thermoelectric material, in addition to the features that thin films of p-type and n-type thermoelectric materials are formed on an electrically insulating substrate, and one end of the p-type thermoelectric material is electrically connected to one end of the n-type thermoelectric material. The thermoelectric element with these features makes it possible to provide an element that exhibits a high thermoelectric conversion efficiency and a satisfactory electrical conductivity, and form a thermoelectric element on substrates of various shapes. This may be seen by reference to the Examples of the instant specification. Applicant submits that this effect is not expected over the cited references.

Therefore, claims 1 to 4, 6 and 7, as amended, are not obvious over Takagi et al., Funahashi et al, and Yoshimoto et al., taken separately or in combination.

Claims 5, 8 and 9 are rejected under 35 U.S.C. §103(a) as being obvious over Takagi et al. (U.S. Patent No. 4,443,650), Funahashi et al. (U.S. Patent No. 6,376,763) and Yoshimoto et al. (U.S. Patent No. 5,352,299) as applied to claim 1 above, and further in view of Buist (U.S. Patent No. 4,859,250). (Office action paragraph no. 7)

The rejection is overcome by the amendment to claim 1.

The Examiner cites Buist for teaching the use of a thermoelectric device within a heat pump or power source device, which places the n-type or p-type semiconductor on flexible or inflexible surfaces, citing the abstract. The Examiner states that it would have been obvious to combine the

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semiconductor substrate based on Tagaki, Funahashi and Yoshimoto with the plastic substrate of Buist.

As discussed above for the above rejection, claim 1, as amended, recites a p-type thermoelectric material and an n-type thermoelectric material that are not disclosed or suggested by Tagaki, Funahashi or Yoshimoto. The invention of Buist is directed to a thermoelectric heat pump or a power source device comprising p-type and n-type materials, and teaches plastic materials such as MYLAR, TEFLON, etc. as substrate materials. Buist, however, nowhere discloses the specific complex oxides recited in the present claims as the thermoelectric materials used.

Claims 5, 8 and 9, as amended, are therefore not obvious under 35 U.S.C. §103(a) over Takagi et al. (U.S. Patent No. 4,443,650), Funahashi et al. (U.S. Patent No. 6,376,763), Yoshimoto et al. (U.S. Patent No. 5,352,299) and Buist (U.S. Patent No. 4,859,250), taken separately or in combination.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicants' undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

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In the event that this paper is not timely filed, the applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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